case study

EnergyManagement System (EnMS)

eThekwini Water and Sanitation – Umbilo Wastewater Treatment Works

Municipal Wastewater Treatment
2014/2015

BACKGROUND

eThekwini Water and Sanitation is a unit of the eThekwini municipality and provides water and sanitation services to all residential and industrial consumers in Durban, KwaZulu-Natal. The unit is continuously looking for ways to improve its services.

Initiatives such as flow limiters, polypropylene water piping, ground tanks and semi-pressure water-service levels, urine-diversion toilets and anaerobic baffled reactors were first introduced in South Africa by eThekwini.

The unit has been involved in the Industrial Energy Efficiency (IEE) Project through several initiatives, including a pump-systems optimisation assessment (conducted at the McCausland pump station) and energy assessments at three of its depots (Springfield, Ottawa and Pinetown) in Durban.

As a result, the unit embarked on the journey to establish an EnMS for each of its wastewater treatment plants. Since there are 27 plants across the province, it was decided to select a pilot plant that best represented the different types of treatment works. Umbilo Wastewater Treatment Works (WWTW) was chosen as the demonstration facility.

The Umbilo WWTW, located at the catchment of the Umbilo River, is made up of two distinct plants: the East Works Bio-filtration Plant and the West Works Activated Sludge Plant. Each plant has its own inlet and outlet.

KEY FINDINGS

In 2014 and 2015 an EnMS was implemented at a total capital investment of less than R1 000. This resulted in a total monetary saving of R280 000 and an energy saving of 287 620kWh per annum. GHG emissions were reduced by 275 tonnes of CO_2. The total payback period for the investment was less than 1 month.

IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

An EnMS consultant was appointed to guide the development of the EnMS, after which an energy team was appointed. The energy team, with the help of the EnMS consultant, conducted an energy review with limited access to energy data (Only West Plant energy consumption (kWh) data was available) to identify and understand the significant energy users, their drivers and management. After the review, the team identified opportunities to improve energy performance. They compiled an EnMS Manual as a high-level management document to define the EnMS and its rollout. An agenda for management review of energy performance was also set.

There are also plans for conducting an ISO 50001 management system internal audit by developing a detailed checklist of the ISO 50001 requirements.

Six of the energy-team members attended an EnMS end-user training course and more training is in the pipeline.

IMPLEMENTATION CHALLENGES

- Time and priorities had to be re-aligned. Demands on the time of top managers and prioritising EnMS roles while at the same time attending to urgent water treatment concerns proved to be very difficult.
- The appointment of an energy team where all key roles were represented, was a challenge, especially as an EnMS had to be driven without regular meetings to ensure sustained progress between consultant visits.
- Data management was initially difficult because of the lack of any kWh data for the East.
- Creating general awareness to support behaviour-based energy performance also had to be prioritised. Initially there was limited awareness of EnMS in the plant.

SUMMARY OF ENERY-SYSTEMS OPTIMISATION INTERVENTIONS.

System	Intervention	Capital Cost (Rand)	Energy saving (KWh / annum)	Savings (Rand)	Estimated Payback period (years)
Activated Sludge Plant - aerators	**Aerator-use pattern optimisation** Reduce use of four 75kW aerators from 59h per day to 46h per day. (The aeration tank at Umbilo WWTW consumes about 83% of the total energy of the West Plant)	*Savings Based on 19-Day Trial* % saved electricity: 19% of aerator kWh X 83% of West Plant X 70% of Total Plant = 11% Total kWh saved: 287 620/annum			

THE FUTURE

- Confirm chemical oxygen demand (COD) impacts on quality of outflow effluent and consolidate the aeration pattern, taking cognisance of peak tariff times and provide training in operator aerator efficiencies.
- Install on-line dissolved-oxygen probes to enable aeration times to be COD-based and install a seasonal setting on the aerators as less aeration is required during cooler months.
- A new energy-efficient screw pump to be installed.
- Investigate the viability of routing more flow to the East Plant that is more energy efficient.

LESSONS LEARNT

If energy performance is integrated into the performance indicators for key management members, it increases the profile and likelihood of success. While energy is an “issue on the side”, there will always be other priorities that take precedence. There is need for increased ownership of energy management.

An active energy team as well as sound and current energy data are critical success factors.

Non-energy benefits of energy interventions should also be considered when developing energy business cases. For example: reduced maintenance costs and extended life span of the aerators if the aeration hours are reduced.

An active and visible energy team makes a difference.

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